

IN THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A process comprising:
patterning a carbon-containing hard mask over a substrate with a carbon rich patterned resist;
removing the carbon rich patterned resist after etching a pattern in the carbon-containing hard mask; and
surface treating the substrate after removing the carbon rich patterned resist to remove residual carbon rich resist disposed in contact with at least one of the top surface of the hard mask and the substrate under conditions that are selective to the hard mask and to the substrate.
2. (Original) The process of claim 1, wherein patterning the carbon-containing hard mask includes patterning amorphous carbon, and wherein surface treating includes using an aqueous ammonium hydroxide and hydrogen peroxide solution.
3. (Previously Presented) The process of claim 1, wherein patterning the carbon-containing hard mask includes patterning amorphous carbon, and wherein surface treating includes using an aqueous ammonium hydroxide and hydrogen peroxide solution in an H₂O:NH₄OH:H₂O₂ volume concentration ratio from about 100:3:2 to about 5:1:2.
4. (Previously Presented) The process of claim 1, wherein patterning the carbon-containing hard mask includes patterning amorphous carbon, and wherein surface treating includes using an aqueous ammonium hydroxide and hydrogen peroxide solution in an H₂O:NH₄OH:H₂O₂ volume concentration ratio from about 5:1:1 to about 5:1:2.

5. (Previously Presented) The process of claim 1, wherein patterning the carbon-containing hard mask includes patterning amorphous carbon, and wherein surface treating includes using an aqueous ammonium hydroxide and hydrogen peroxide solution in an $H_2O:NH_4OH:H_2O_2$ volume concentration ratio from about 100:1:2 to about 100:3:2.

6. (Previously Presented) The process of claim 1, wherein patterning the carbon-containing hard mask includes patterning amorphous carbon, and wherein surface treating includes using an aqueous ammonium hydroxide and hydrogen peroxide solution in an $H_2O:NH_4OH:H_2O_2$ volume concentration ratio from about 100:1:1 to about 100:3:3.

7. (Currently Amended) A process comprising:
patterning a carbon-containing hard mask over a substrate with a carbon rich patterned resist;
removing the carbon rich patterned resist after etching a pattern in the carbon-containing hard mask; and
surface treating the substrate after removing the carbon rich patterned resist to remove residual carbon rich resist disposed in contact with at least one of the top surface of the hard mask and the substrate under conditions that are selective to the hard mask and to the substrate, wherein surface treating includes an aqueous ammonium hydroxide and hydrogen peroxide solution that is applied in a time range from about 2 minutes to about 45 minutes.

8. (Original) The process of claim 7, wherein surface treating includes surface treating with an aqueous ammonium hydroxide and hydrogen peroxide solution that is applied in a temperature range from about room temperature to about 70° C.

9. (Original) The process of claim 7, wherein patterning the carbon-containing hard mask includes patterning amorphous carbon, wherein surface treating includes surface treating with an aqueous ammonium hydroxide and hydrogen peroxide solution that is applied in a temperature range from about room temperature to about 70° C.

10. (Previously Presented) The process of claim 7, wherein patterning the carbon-containing hard mask includes patterning amorphous carbon, wherein surface treating includes:

surface treating with an aqueous ammonium hydroxide and hydrogen peroxide solution in an H₂O:NH₄OH:H₂O₂ volume concentration ratio from about 5:1:1 to about 100:3:2; and a temperature range from about room temperature to about 70° C.

11. (Previously Presented) The process of claim 7, wherein patterning the carbon-containing hard mask includes patterning amorphous carbon, wherein surface treating includes:

surface treating with an aqueous ammonium hydroxide and hydrogen peroxide solution in an H₂O:NH₄OH:H₂O₂ volume concentration ratio of about 100:3:2; a time of about 10 minutes; and a temperature of about 55° C.

12. – 23. (Canceled)

24. (Currently Amended) A process comprising:

patterning a carbon-containing hard mask with a carbon rich patterned resist over a substrate;

removing the patterned resist; and

surface treating the substrate after removing the carbon rich patterned resist to remove residual carbon rich resist disposed in contact with at least one of the top surface of the hard mask and the substrate under conditions that are selective to leaving the carbon-containing hard mask, wherein surface treating includes surface treating with a rinse solution selected from aqueous ammonium hydroxide and hydrogen peroxide solution, aqueous sulfuric acid and citric acid solution, aqueous sulfuric acid and hydrogen peroxide solution, ozone with dilute ammonium hydroxide, ozone with dilute hydrogen fluoride, and combinations thereof.

25. (Previously Presented) The process of claim 24, wherein surface treating includes surface treating with a rinse solution:

in a majority proportion aqueous ammonium hydroxide and hydrogen peroxide solution; and

in a minority proportion at least one of aqueous sulfuric acid and citric acid solution, aqueous sulfuric and hydrogen peroxide solution, ozone with dilute ammonium hydroxide, and ozone with dilute hydrogen fluoride.

26. (Previously Presented) The process of claim 24, wherein surface treating includes surface treating with a rinse solution:

in a majority proportion aqueous ammonium hydroxide and hydrogen peroxide solution;

in a minority proportion at least one of aqueous sulfuric acid and citric acid solution, aqueous sulfuric and hydrogen peroxide solution, ozone with dilute ammonium hydroxide, and ozone with dilute hydrogen fluoride; and the process further including:

surface treating for a time range from about 2 minutes to about 45 minutes.

27. (Previously Presented) The process of claim 24, wherein surface treating includes surface treating with a rinse solution:

in a majority proportion aqueous ammonium hydroxide and hydrogen peroxide solution;

in a minority proportion at least one of aqueous sulfuric acid and citric acid solution, aqueous sulfuric and hydrogen peroxide solution, ozone with dilute ammonium hydroxide, and ozone with dilute hydrogen fluoride; and the process further including:

surface treating for a temperature range from about room temperature to about 70° C.

28. (Previously Presented) The process of claim 24, wherein surface treating includes surface treating with a rinse solution:

in a majority proportion aqueous ammonium hydroxide and hydrogen peroxide solution;

in a minority proportion at least one of aqueous sulfuric acid and citric acid solution, aqueous sulfuric and hydrogen peroxide solution, ozone with dilute ammonium hydroxide, and ozone with dilute hydrogen fluoride; and the process further including:

surface treating for a time range from about 2 minutes to about 45 minutes, and for a temperature range from about room temperature to about 70° C.

29. (Currently Amended) A process comprising:

 patterning a carbon-containing hard mask with a carbon rich patterned resist over a substrate;

 removing the carbon rich patterned resist; and

 surface treating the substrate after removing the carbon rich patterned resist to remove residual carbon rich resist disposed in contact with at least one of the top surface of the hard mask and the substrate under conditions that are selective to leaving the carbon-containing hard mask, wherein surface treating includes:

 in a plurality proportion aqueous ammonium hydroxide and hydrogen peroxide solution; and

 in a minority proportion at least two of aqueous sulfuric acid and citric acid solution, aqueous sulfuric and hydrogen peroxide solution, ozone with dilute ammonium hydroxide, and ozone with dilute hydrogen fluoride.

30. (Original) The process of claim 29, wherein surface treating includes surface treating for a time range from about 2 minutes to about 45 minutes, and a temperature range from about room temperature to about 70° C.

31. (Previously Presented) The process of claim 29, wherein surface treating includes surface treating with a rinse solution:

 the plurality proportion of aqueous ammonium hydroxide and hydrogen peroxide solution in an H₂O:NH₄OH:H₂O₂ volume concentration ratio of about 100:3:2; and

 the minority proportion including aqueous ammonium hydroxide and hydrogen peroxide solution in an H₂O:NH₄OH:H₂O₂ volume concentration ratio of about 5:1:1.

32. (Previously Presented) The process of claim 29, wherein surface treating includes surface treating with a rinse solution:

 the plurality proportion of aqueous ammonium hydroxide and hydrogen peroxide solution in an H₂O:NH₄OH:H₂O₂ volume concentration ratio of about 100:3:2;

a first minority proportion of aqueous ammonium hydroxide and hydrogen peroxide solution in an H₂O:NH₄OH:H₂O₂ volume concentration ratio of about 5:1:1; and

a second minority proportion of at least one solution selected from aqueous sulfuric acid and citric acid solution, aqueous sulfuric and hydrogen peroxide solution, ozone with dilute ammonium hydroxide, and ozone with dilute hydrogen fluoride.

33. (Previously Presented) The process of claim 29, wherein surface treating includes the rinse solution:

a plurality proportion of aqueous ammonium hydroxide and hydrogen peroxide solution in an H₂O:NH₄OH:H₂O₂ volume concentration ratio of about 100:3:2;

a first minority proportion of aqueous ammonium hydroxide and hydrogen peroxide solution in an H₂O:NH₄OH:H₂O₂ volume concentration ratio of about 5:1:1;

a second minority proportion of at least one solution selected from aqueous sulfuric acid and citric acid solution, aqueous sulfuric and hydrogen peroxide solution, ozone with dilute ammonium hydroxide, and ozone with dilute hydrogen fluoride; and

wherein the second minority proportion is less than the first minority proportion.

34. (Previously Presented) The process of claim 29, wherein surface treating includes the rinse solution:

a plurality proportion of aqueous ammonium hydroxide and hydrogen peroxide solution in an H₂O:NH₄OH:H₂O₂ volume concentration ratio of about 100:3:2;

a first minority proportion of aqueous ammonium hydroxide and hydrogen peroxide solution in an H₂O:NH₄OH:H₂O₂ volume concentration ratio of about 5:1:1;

a second minority proportion of at least one solution selected from aqueous sulfuric acid and citric acid solution, aqueous sulfuric and hydrogen peroxide solution, ozone with dilute ammonium hydroxide, and ozone with dilute hydrogen fluoride; and

wherein the second minority proportion is less than the first minority proportion; and the process further including:

surface treating a time range from about 2 minutes to about 45 minutes; and a temperature range from about room temperature to about 70° C.

35. – 38. (Canceled)

39. (Currently Amended) A process comprising:

 patterning a carbon-containing hard mask over a substrate with a carbon rich patterned photoresist;

 removing the carbon rich patterned photoresist;

 surface treating the substrate after removing the carbon rich patterned photoresist to remove residual carbon rich photoresist in contact with the substrate under conditions that are selective to the hard mask and to the substrate; and

 dry etching the substrate through the hard mask.

40. (Original) The process of claim 39, wherein the carbon-containing hard mask includes amorphous carbon, and wherein surface treating includes surface treating using an aqueous ammonium hydroxide and hydrogen peroxide solution.

41. (Original) The process of claim 39, wherein patterning the carbon-containing hard mask includes patterning amorphous carbon, and wherein surface treating includes surface treating using an aqueous ammonium hydroxide and hydrogen peroxide solution, wherein surface treating includes surface treating for a time range from about 2 minutes to about 45 minutes, and wherein surface treating also includes surface treating at a temperature range from about room temperature to about 70° C.

42. (Previously Presented) The process of claim 39, wherein surface treating includes surface treating using an aqueous sulfuric acid and citric acid solution in an H₂O:H₂SO₄:C₆H₄O₇ volume concentration ratio of about 100:3:2 to about 100:2:2, a time of about 10 minutes, and a temperature of about 55° C.

43. – 50. (Canceled)